OPERATIONALLY CHANGEABLE MULTIPLE NOZZLES SPRINKLER

DESCRIPTION

1. Technical Field

This invention relates to oscillatable sprinklers with multiple nozzles of different flow rates and discharge trajectories that can be selectably changed when the sprinkler is installed and operating.

2. Background Art

In U.S. Pat. No. 5,098,021 an integrated system is set forth for varying the flow rate of a single nozzle to meet precipitation rate requirements for varying arcs of oscillating coverage. No provision is provided to correct the flow rate of the nozzle for varying ranges when using a nozzle stream break-up screw to limit the nozzle range.

U.S. Pat. No. 5,104,045 relates to sprinkler nozzles having flow passages for obtaining desired precipitation coverage. This patent shows how nozzles are typically installed and retained in oscillating sprinkler nozzle housings.

U.S. Pat. No. 4,867,378 shows a sprinkler device for directing a flow of water therefrom having a single nozzle in a nozzle housing assembly, said sprinkler having an output drive shaft.

Other sprinklers in the market place have separate nozzles of different flow rates or trajectories but can only be installed into the sprinkler nozzle housing when the sprinkler is not operating. In order to change to a new desired nozzle the undesired nozzle which was installed in the sprinkler's nozzle housing must also be removed before the new desired replacement nozzle can be installed.

DISCLOSURE OF INVENTION

It is an object of this invention to make it possible to select a nozzle for the desired range and flow rate to provide the desired precipitation rate while the sprinkler is operating. This is accomplished by molding or inserting various nozzles around the circumference of a cylinder which is rotationally mounted on the nozzle housing. The desired nozzle can be rotated into the flow path while the sprinkler is operating if it is desired to change the range and/or flow rate of the sprinkler. After installation if it is found that a local area of the yard needs more or less water from that of the other sprinklers running in that irrigation zone it is only necessary to rotate the multiple nozzle selection sleeve, or cylinder, to a different flow rate or trajectory nozzle as indicated around the top circumference of the nozzle selection sleeve to provide an increased or decreased precipitation for this area of the yard.

Also, the sprinkler may be shut off at the sprinkler by turning the nozzle selection cylinder to a blank rotational location indicated as off.

An alternate configuration is also shown which also allows the nozzle to be changed during operation from the top and behind the stream, but has the disadvantage that the other nozzles must be carried separately and are not present on the sprinkler at all times and immediately available after installation.

This concept makes it simple to locally increase or decrease the sprinklers flow rate to better match the precipitation to varying soil or sun light conditions after the installation has been completed and the landscaping has stabilized.

Optimum water usage can thus be more easily achieved. The easy removal of the nozzle selection sleeve also makes

cleaning of dirt or debris from the nozzle easy compared to other sprinklers now on the market and can be done without having to shut the system off and then turned back on after the nozzle has been cleaned.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a fragmentary sectional side view of a rotatable sprinkler nozzle housing assembly being driven by an output shaft and showing the rotationally mounted multiple nozzle selection sleeve.

FIG. 2 is a top view of the nozzle housing assembly showing the nozzle identification around the top circumference of the nozzle selection sleeve. Also the removal slot and retention lug can be seen for retaining or allowing removal of the nozzle selection sleeve from the nozzle housing assembly.

FIG. 3 is a fragmentary sectional side view of a rotatable sprinkler nozzle housing assembly showing a nozzle insert plate removable and insertable from the top.

FIG. 4 is a top view with a cut away of the nozzle housing assembly showing the removable nozzle insert plate in position.

FIG. 5 shows the multiple nozzle selection sleeve removed from the nozzle housing.

FIG. 6 shows a nozzle insert plate.

BEST MODE FOR CARRYING OUT INVENTION

Referring to FIG. 1 and FIG. 2 of the drawings, a rotatable nozzle sprinkler is shown having a cylindrical nozzle housing assembly 1 mounted for rotation about axis x—x on the top of a riser assembly 2. The riser assembly has a center shaft opening at its upper end for the nozzle housing assembly drive shaft 5 to exit the riser assembly 2 and be connected to the nozzle housing assembly 1.

The nozzle drive shaft 5 is hollow and water is supplied to the nozzle housing 16 through the hollow center passage of the nozzle drive shaft 5 into a flow passage 15 in the nozzle housing 16. Water enters the riser assembly 2 at its lower end and is used to power a rotary drive mechanism for turning the nozzle drive shaft 5 before exiting the riser assembly through the hollow center passage of the nozzle drive shaft 5.

The nozzle housing 16 flow passage 15 extends through the nozzle housing 16 to the outside of the nozzle housing at an upward angle. The constructions of a nozzle housing with a flow passage is shown in U.S. Pat. No. 5,098,021 and U.S. Pat. No. 5,104,045.

The flow passage 15 in the nozzle housing does not determine the sprinkler's stream trajectory for this design. A separate nozzle selection cylindrical sleeve 40 which is rotationally mounted on the nozzle housing 16 has multiple individual nozzles 42 molded into the sleeve wall 44. Each nozzle can be separately configured to give a desired trajectory angle and sized to provide a desired flow rate.

The nozzle selection sleeve can be easily molded with each nozzle shape being determined by the shape of the end of individual core pins located radially around the mold's sleeve cavity. Also their entry angle into the sleeve cavity can be used to determine the nozzle trajectory. These core pins can be loaded out and cammed into molding position when the mold is closed to the molding position. Thus this design lends itself to mass production. The inside surface is the sleeve wall and serves as the upstream surface of the sharp edge nozzle passages. This is a satisfactory sharp edge

orfice configuration for sprinkler nozzle ranges of 40 feet and less. If a contour on the upstream side of the nozzles is required the nozzles requiring this may be inserted and sonic welded or solvent welded into place or a more complicated plastic injection molding tool can be fabricated with short travel cores around the inside of the sleeve to also provide upstream contour for the nozzles which require it. The nozzle selection sleeve is shown separately in FIG. 5.

The nozzle selection sleeve 40 is rotated by holding the lower portion of the nozzle housing 46 while turning the nozzle selection sleeve 40 with rim 48 until the position selection arrow 50 points to the proper alignment line 52 on the top ring area 68 of the nozzle selection sleeve 40.

The flow passage 15 of nozzle housing 16 is pressure sealed to the rotational nozzle selection sleeve 40 by an "O" ring 60 in groove 62 which is molded into the nozzle housing 16 around the flow passage 15 opening to the outside of the nozzle housing 16. Obviously, the "O" ring or any other cross sectionally shaped seal (60 in FIG. 1 and 80 in FIG. 3) bears against the inner surface of the nozzle selection sleeve (40 in FIG. 1 and 80 in FIG. 3) to assure positive sealing around the discharge end of the passage 15 and 15' respectively. This assures that the water intended to be discharged through the orifice or nozzle for sprinkling purposes is not adversely affected and water will not leak internally in the nozzle housing which would adversely impact the sprinkler. This can be done by putting the "O" ring groove 62 shape on the sliding core of the plastic injection molding tooling that generates the side hole of flow passage 15 in the nozzle housing 16.

The nozzle selection sleeve 40 can be retained on the nozzle housing 16 by lip 66 which over hangs rim 68 of the nozzle selection sleeve 40. The nozzle selection sleeve 40 may be removed from the nozzle housing 16 by rotating it to the position where notch 64 in rim 68 under lies lip 66 and the nozzle selection sleeve 40 can then be removed or put onto the nozzle housing 16. Taper 63 on the inside circumference bottom edge of the nozzle selection sleeve allows the sleeve to move over the "O" ring seal during installation.

The nozzle selection sleeve 40 is shown removed from the nozzle housing in FIG.5. Different sleeves with different nozzles selections can be provided for the same sprinkler.

An alternate configuration is shown in FIG. 3 and FIG. 4 in which the nozzle may also be changed from the top of the sprinkler with the sprinkler operating.

Referring to FIG. 3 and 4 of the drawings a rotating nozzle sprinkler housing is shown having a cylindrical nozzle housing assembly 1' mounted for rotation about axis x—x on the top of a riser assembly 2'.

The nozzle assembly 1' is rotated and supplied with water through hollow drive shaft 5'. The nozzle housing 16' flow passage 15' is supplied with pressurized water from the hollow nozzle drive shaft 5' and is sealed to an insertable nozzle 84 and plate 80 with nozzle 81 by "O" ring 82 in groove 83 the nozzle housing 16' flow passage 15'.

The nozzle plate slides down into groove 86 of the nozzle housing 16' and is pressed against the nozzle "O" ring seal 82 which is compressed slightly as the lead in taper 100 of the nozzle plate passed the "O" ring seal 82.

The nozzle plate is removable from the top of the nozzle housing by putting a screwdriver or sprinkler key into recess 90 and lifting the nozzle plate by edge 91.

A nozzle plate is shown removed from the nozzle housing in FIG. 6.